Cosmogenic ^{36}Cl exposure ages of full and late-glacial ice caps on Mauna Kea, Hawai‘i

JEFFREY S. PIGATI Department of Geosciences, University of Arizona, Tucson AZ 85721
MAREK ZREDA Department of Hydrology and Water Resources, University of Arizona, Tucson AZ 85721
PETER ALMASI Department of Hydrology and Water Resources, University of Arizona, Tucson AZ 85721
DAVID ELMORE Department of Physics, Purdue University, West Lafayette IN 47907
EDWARD WOLFE U.S. Geological Survey (retired), Prescott AZ 86305
WARREN SHARP Berkeley Geochronology Center, Berkeley CA 94709

Glacial landforms and deposits exposed in deep gulches on the south and east flanks of Mauna Kea, Hawai‘i (19.8°N, 155.5°W) indicate that the summit area of the volcano was covered by ice caps at least four different times during the late Pleistocene. The maximum extents of the two latest ice caps (older and younger Makanaka) were essentially the same, reaching ~3400 m above sea level or ~800 m below the summit. These ice caps left behind prominent end moraines, ground moraine, several outwash channels, and at least one boulder-dominated alluvial fan that was probably created by glacial meltwater. New in-situ cosmogenic ^{36}Cl exposure ages for these landforms suggest that the older Makanaka ice cap began retreating 23.3±2.2 ka (2σ - weighted average standard deviation; ka = thousand calendar years) ago, coincident with the last glacial maximum (LGM), whereas the younger Makanaka ice cap began retreating 13.3±0.7 ka ago, near the onset of the Younger Dryas (YD) chronozone. At present, our cosmogenic ^{36}Cl results do not allow us to differentiate between an early YD in the central Pacific (i.e. pre-12.9 ka ago), surging of the younger Makanaka ice cap early in the YD and retreat shortly thereafter, or a systematic bias in our age calculations as potential reasons for the retreat of the latest ice cap falling at the beginning, rather than at the end, of the YD. Regardless, the general agreement between our glacial chronology and the timing of the LGM and YD elsewhere implies that late Pleistocene ice caps on Mauna Kea responded quickly to climatic changes in the North Pacific, and ultimately to conditions in the North Atlantic.